

REMARKS

IN THE SPECIFICATION

In section 1, first paragraph, of the Office Action, the Examiner objected to the disclosure statement that distribution of an output voltage is prevented if a hazardous condition such as an accidental reversal of the hot line wire with the neutral wire has occurred. Paragraphs 0006-0008, 0019 and 0021 have been amended to indicate that the present invention includes an indicator or indicators in the element 40 “power line condition and indicator circuits”. This will alert the user to an unsafe reversal condition and the user will thereby be prompted to correct the deficiency before proceeding to connect peripheral devices to the tri-mode over-voltage protection and disconnect circuit device. This action is believed to be conventional in the art and Applicants apologize for not making it explicit in the application.

In section 1, fourth paragraph, of the Office Action, the Examiner objected to paragraph 0028 for failing to set forth the invention or provide other specifics. Applicants respectfully believe that paragraph 0028 provides other specifics of the invention, to wit the meaning of usage of singular and plural forms of nouns and the inclusion in the invention of structural and functional equivalents that are known to those of ordinary skill in the art. By making these explicit statements Applicants respectfully assert that they are providing other specifics within the meaning of the regulations. Applicants therefore respectfully request that this objection be withdrawn and paragraph 0028 be retained in the application.

IN THE CLAIMS

CLAIM OBJECTIONS

In section 2, first paragraph, of the Office Action, the Examiner objected to Claims 1 and 4 for not clearly claiming the action of TF5. Applicants have amended Claim 1 to claim, in part,

“whereby, in the event of an over-voltage condition between the hot line and neutral line *the second and third* (emphasis added) over-voltage protection circuits respond by passing sufficient current to cause at least one protective device to open.”

As indicated in application paragraph 0022, fuse TF5 is associated with over-voltage

protection circuits 1 and 4 (MOVs 1 and 4). Claim 1 has been amended to clearly state that the action to open the hot and neutral lines is taken by over-voltage circuits 2 and 3. Thus, fuse TF5 need not be claimed. Claim 4 depends from Claim 1 through claims 2 and 3, and is therefore allowable as depending from an allowable claim. Applicants respectfully request that the above amendment be entered, this objection be withdrawn, and Claims 1 and 4 be passed to allowance.

In section 3 of the Office Action, the Examiner objected to Claim 19 as being a duplicate of Claim 18. Claim 18 has been amended to depend from Claim 17 while Claim 19 depends from Claim 16. Applicants respectfully request that the above amendment be entered, this objection be withdrawn and Claims 18 and 19 be passed to allowance.

35 U.S.C. §112 REJECTIONS

In section 4, first paragraph, of the Office Action, the Examiner rejected Claim 11 under 35 USC §112, first paragraph, as failing to comply with the enablement requirement by not explicitly claiming how the hot and neutral lines are simultaneously opened. Applicants have amended Claim 11 as follows:

11. (currently amended) A tri-mode over-voltage protection and disconnect circuit apparatus, the apparatus comprising:
 - a. a first over-voltage protection means disposed between a hot line and a ground line;
 - b. a second and third over-voltage protection means disposed between the hot line and a neutral line; and
 - c. a fourth over-voltage protection means disposed between the neutral line and the ground line,whereby, in the event of an over-voltage condition on the hot line, the second and third over-voltage protection means respond by each opening a thermal protective device, thereby ~~simultaneously~~ causing an open state such that the hot line and the neutral line are not distributed as an output voltage.

Applicants believe that the action of over-voltage protection circuits 2 and 3 occurs so rapidly that the disconnection of line and neutral outputs, for all intents and purposes, is simultaneous, given the manufacturing tolerances of electronic components. However, the Examiner correctly observes that potentially fuse TF 3 is subject, at least momentarily, to an additional leakage current and therefore potentially may blow before fuse TF 6. Applicants have amended Claim 11 to delete reference to “simultaneously” in order to more precisely

claim the present invention. Applicants respectfully request this amendment be approved, this rejection be withdrawn, and Claim 11 be passed to allowance.

35 U.S.C. §103 REJECTIONS

In section 5, first paragraph, of the Office Action, the Examiner rejected Claims 1-19 under 35 U.S.C. §103(a) as being unpatentable over Lee, U.S. patent 4,901,183 in view of Jeffries et al., U.S. patent 6,055,147 (Jeffries). The Examiner states that Lee teaches the placement of MOV circuits across the hot-neutral, hot-ground and neutral-ground lines, but did not disclose two over-voltage protection circuits connected in parallel between the hot line and the neutral line.

Lee teaches a four-stage surge protection device having fuses, capacitors, MOVs, coils, and bidirectional silicon transient voltage suppression devices, the latter circuitry intended for absorbing the fast-rising edge of transients (abstract and col 3, lines 20-39). Lee further teaches that the fuses are not user-replaceable items and that the device requires the services of an authorized repair service person after exposure to over-voltages (col 4, lines 42-58). Lee neither suggests nor teaches that any stage of the device may be eliminated. Further, Lee provides no motivation to do so.

The present invention provides tri-mode over-voltage protection through the use of two MOV protection circuits in parallel across the hot and neutral lines and has no bidirectional silicon transient voltage suppression devices. This MOV redundancy negates the need for the bidirectional silicon transient voltage suppression devices of Lee and furthermore allows for user-replaceable fuses. Lee teaches that lockup of the bidirectional silicon transient voltage suppression devices precludes user replacement of the fuses, even if the user correctly inserted the proper fuses (col 4, lines 52-55). Applicants' stated purpose of the invention includes efficient circuit configuration, or economy of components (paragraph 0005 lines 16-18). Thus, Applicants respectfully assert that Lee teaches away from the present invention by including capacitors, coils and bidirectional silicon transient voltage suppression devices.

Amended claim 1 reads,

1. A tri-mode over-voltage circuit protection and disconnect apparatus, the apparatus comprising:
 - a. a first over-voltage protection circuit disposed between a hot line and a ground line;
 - b. a second and a third over-voltage protection circuit disposed between the hot line

and a neutral line; and

c. a fourth over-voltage protection circuit disposed between the neutral line and the ground line;

whereby the hot line and the neutral line are distributed as an output voltage when the over-voltage protection circuits are functioning, and

whereby, in the event of an over-voltage condition between the hot line and neutral line the second and third over-voltage protection circuits respond by passing sufficient current to cause at least one protective device to open.

Applicants respectfully point out that the claimed invention comprises two over-voltage protection circuits disposed between the hot and neutral lines, a circuit neither taught nor suggested by Lee. In fact, the second over-voltage protection circuit serves a different purpose than do the bidirectional silicon transient voltage suppression devices of Lee. Independent claims 7, 11 and 16 claim the same arrangement of over-voltage protective circuits. Claims 2-6, 8-10, 12-15 and 17-19 properly depend from and further limit the independent claims and are thus allowable by reason of their dependency on allowable claims. Applicants therefore respectfully request that the above amendment be entered, this rejection be withdrawn, and Claims 1-19 be allowed.

In section 5, third paragraph, of the Office Action, the Examiner cited Jeffries as teaching the use of parallel MOVs in a surge protection device. Jeffries teaches a device for arranging MOVs, plus fuses in series with each MOV, in parallel for use with printed circuit boards, the device providing multiple surge protection circuits for higher current capacity, each circuit having an MOV protected by the fuse. The Examiner states that Jeffries suggests that MOVs can be placed between phase, neutral and ground elements, but examination of Jeffries Figures 1 and 2 fails to teach or disclose a specific configuration therefor. Placing an MOV plus fuse in series in parallel across the L-N pairing would not result in the present circuit but would instead result in the MOV being rendered inoperative when the series fuse opens. Therefore, Applicants respectfully assert that it is not obvious to combine Jeffries with Lee as the Examiner states.

Jeffries suggests that element 130 may be a neutral and element 140 may be a ground, but Figures 1 and 2 fail to show how these elements are connected to a power source and output. Further, Jeffries fails to teach how element 120, the phase or hot lead, is connectable to the output. Moreover, Jeffries fails to disclose any mode by which the phase or hot lead is interrupted in the event of an over-voltage condition.

The Applicants therefore respectfully assert that, absent explicit teaching, the teaching

of a printed circuit board device using parallel subassemblies by Jeffries does not make obvious how a minimum of components can be arranged to provide over-voltage surge protection for a connected peripheral device as in the present invention. Applicants respectfully assert that there is no suggestion in Jeffries that would lead a practitioner to replace the bidirectional silicon transient voltage suppression devices of Lee with an MOV over-voltage protection circuit. Absent any suggestion or motivation in either Lee or Jeffries to combine their respective teachings, a practitioner would not be lead to alter the circuitry of Lee as in the present invention. Applicants respectfully request therefore that the above amendment be entered, this rejection be withdrawn, and Claims 1-19 be allowed.

In section 5, third paragraph, of the Office Action, the Examiner rejected Claims 7, 13 and 17 as being obvious in view of Lee, citing Lee "it will be understood that many modifications, such as the use of circuit breakers, manual ON/OFF switches, power indicators, failure indicators and the like, will be readily apparent to those of ordinary skill in the art " (col 6 lines 42-46). As noted above, the Examiner acknowledges that Lee neither suggests nor teaches the use of two MOV over-voltage protection circuits in parallel between the hot and neutral leads. Instead, Lee teaches the use of silicon transient suppressor circuitry which locks up, rendering the device unusable until serviced by a trained service technician.

Applicants respectfully disagree with the Examiner that it is obvious to replace the silicon transient suppressor circuitry of Lee with a second MOV circuit in parallel with the first MOV circuitry across the hot and neutral leads. If this were obvious to Lee, he would have included this major variation in his statement of obvious changes cited above. Applicants respectfully assert that the present inventive circuitry most economically and uniquely achieves a user-friendly device which is neither suggested, taught, nor made obvious by Lee. Applicants' independent Claim 7 therefore properly claims a unique apparatus containing dual MOV over-voltage protection and is not made obvious by Lee. Depending Claims 13 and 17 properly depend from allowable claims 11 and 16 respectively and are thus allowable by reason of their dependency. Applicants respectfully request therefore that the above amendment be entered, this rejection be withdrawn, and Claims 7, 13 and 17 be allowed.

In section 5, forth paragraph, of the Office Action, the Examiner rejected Claims 2, 6, 9 and 14 as being taught by Lee. Claims 2, 6, 9 and 14 properly depend from and further define the invention of Claims 1, 7 and 11 respectively, which Applicants respectfully assert

are allowable as discussed above. Therefore, Applicants respectfully request that the above amendment be entered, this rejection be withdrawn, and Claims 2, 6, 9 and 14 be passed to allowance.

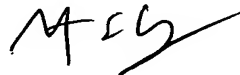
In section 5, fifth paragraph, of the Office Action, the Examiner rejected Claim 3 as being taught by Lee. Claim 3 properly depends from and further define the invention of Claim 1, which Applicants respectfully assert is allowable as discussed above. Therefore, Applicants respectfully request that the above amendment be entered, this rejection be withdrawn, and Claim 3 be passed to allowance.

In section 5, sixth paragraph, of the Office Action, the Examiner rejected Claims 5, 10, 15 and 18 as being taught by Lee. Claims 5, 10, 15 and 18 properly depend from and further define the invention of Claims 1, 7, 11 and 16 respectively, which Applicants respectfully assert are allowable as discussed above. Therefore, Applicants respectfully request that the above amendment be entered, this rejection be withdrawn, and Claims 5, 10, 15 and 18 be passed to allowance.

CONCLUSION

Claims 1-3, 6-7, 9, 11, 13-14, and 16-18 are herein amended to more distinctly identify and clearly claim the present invention, notwithstanding Applicants' belief that the claims were allowable as originally presented. Applicants believe the claims are now allowable. Applicants respectfully submit that the presently claimed invention is patentably distinct over the cited references, and Applicants therefore believe that the claims are non-obvious in view of Lee and Jeffries *et al.* as required by 35 U.S.C. 103. Therefore Applicants believe the present invention as claimed is patentable. In view of the foregoing amendment and remarks, favorable consideration by the Examiner, entry of the above amendment, withdrawal of the present objections and rejections, allowance of claims 1-19, and passage of the present application to issuance are accordingly solicited. The Examiner is cordially invited to telephone the undersigned for any reason which would advance the pending claims toward allowance.

Respectfully submitted,



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ANNOTATED PARAGRAPHS TO SHOW CHANGES

[0006] An object of the present invention is to provide an apparatus and a method which prevent ~~(1) the hazardous condition occurring at the wall receptacle which arises from accidental reversal of the line wire (L) with the neutral wire (N), from adversely affecting at least one peripheral device in the line, and (2) the overheating and destruction of MOVs in an over-voltage protection circuit by providing an efficient circuit configuration (i.e., the minimum number of components for device size reduction) which assures a rapid simultaneous disconnect of both the hot line and neutral power lines, and responds to the overheating of MOVs in an over-voltage protection circuit by opening the circuit to simultaneously disconnect both the hot line and the neutral line feeding a load when the over-voltage even occurs in the line-to-neutral (L-N) pairing.~~

[0007] Another object of the present invention is to provide an apparatus and a method which prevent ~~(1) the hazardous condition occurring at the wall receptacle which arises from accidental reversal of the line wire with the neutral wire, wire from adversely affecting at least one peripheral device in the line, and (2) the overheating and destruction of MOVs in an over-voltage protection circuit by opening the circuit to simultaneously disconnect both the hot line and the neutral line feeding a load when the over-voltage event occurs in any of three wire pairings: line-to-neutral (L-N), line-to-ground (L-G), or neutral-to-ground (N-G). by detecting such reversal upon connection of the apparatus to the wall receptacle and alerting the user to the hazardous condition by appropriate illumination of warning lights or sounding of an audible alarm, or both. The user can then effect a correction before proceeding.~~

[0008] Accordingly, the present invention provides a single-phase over-voltage protection circuit apparatus for all AC power lines and combinations thereof. In particular, the present invention provides an apparatus and a method which prevent (1) the hazardous condition occurring at the wall receptacle arising from accidental reversal of the line wire with the neutral wire from adversely affecting at least one peripheral device in the line by alerting the user to the unsafe condition, and (2) the overheating and destruction of MOVs in an over-voltage protection circuit by providing an efficient circuit configuration which assures a rapid simultaneous disconnect of both the hot line and neutral line. The present invention achieves this by opening the circuit to disconnect either or both of the hot line and neutral line feeding

a load when the over-voltage event occurs in ~~any of the three following wire pairings: hot line to neutral line (L-N), hot line to ground line (L-G), or neutral line to ground line (N-G).~~ the hot line to neutral line (L-N) pairing.

[0019] The apparatus 10 may further comprise a warning feature 40 (i.e., an indicator or indicators that the hot line and neutral line are reversed, and/or an over-voltage indicator) for indicating that at least one of the four MOVs 20 has responded to an over-voltage condition which has effected opening of at least one respective thermal fuse 30. The warning feature 40 comprises at least one warning feature selected from a group of warning features consisting essentially of an indicator light, an LED indicator, and/or an audible alarm such as a buzzer or the like, warning that AC power has been disconnected to the peripheral equipment due to an over-voltage (O-V) condition. The warning devices may include normally-on green indicators indicating proper operation and/or red indicators indicating a fault operation when illuminated. As depicted and by example only, the warning feature 40 is separately energized from the input AC power source through circuit 11a-12a. When an overvoltage causes disconnection of either hot line 11 or neutral line 12, appropriate indicator lights will be illuminated and/or an audible alarm may sound, indicating that the device 10 has disconnected power to the load. The apparatus 10 may be disengaged from the power source after alerting by the warning feature 40, and may then be replaced or reset. Apparatus 10 may optionally include ON/OFF switches (not shown), for power distribution, and/or for safety considerations. Further, apparatus 10 may include electronic filters at either the input 14 or output 15 sides to remove interference such as static or noise, as is known in the art.

[0021] The apparatus, as described in Example 1, may further comprise an indicator or indicators that the hot line and neutral lines are reversed and/or at least one warning feature for indicating that an over-voltage condition has occurred, the indicators and at least one warning feature being selected from a group of warning features consisting essentially of an indicator light and an LED indicator.